



NC LEGISLATIVE RESEARCH COMMISSION

ADVISORY SUBCOMMITTEE ON OFFSHORE ENERGY EXPLORATION



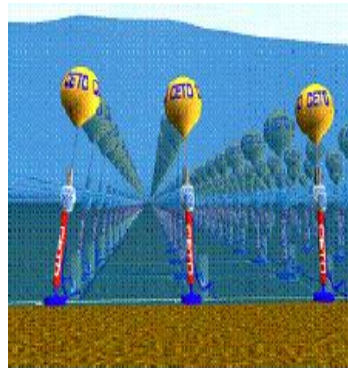
Steven Kopf
July 28, 2009

Wave Energy technologies

Point Absorber



Pressurized Seawater



Oscillating Water Column



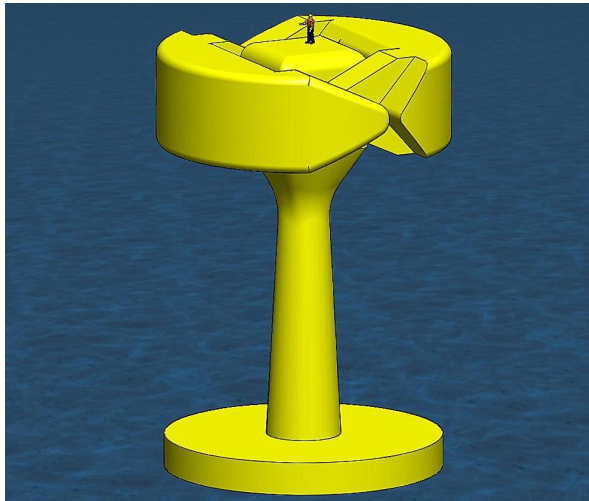
Attenuator



Overtopping



Columbia Power LLC



Principle of Operation:
Magnetic Direct Drive

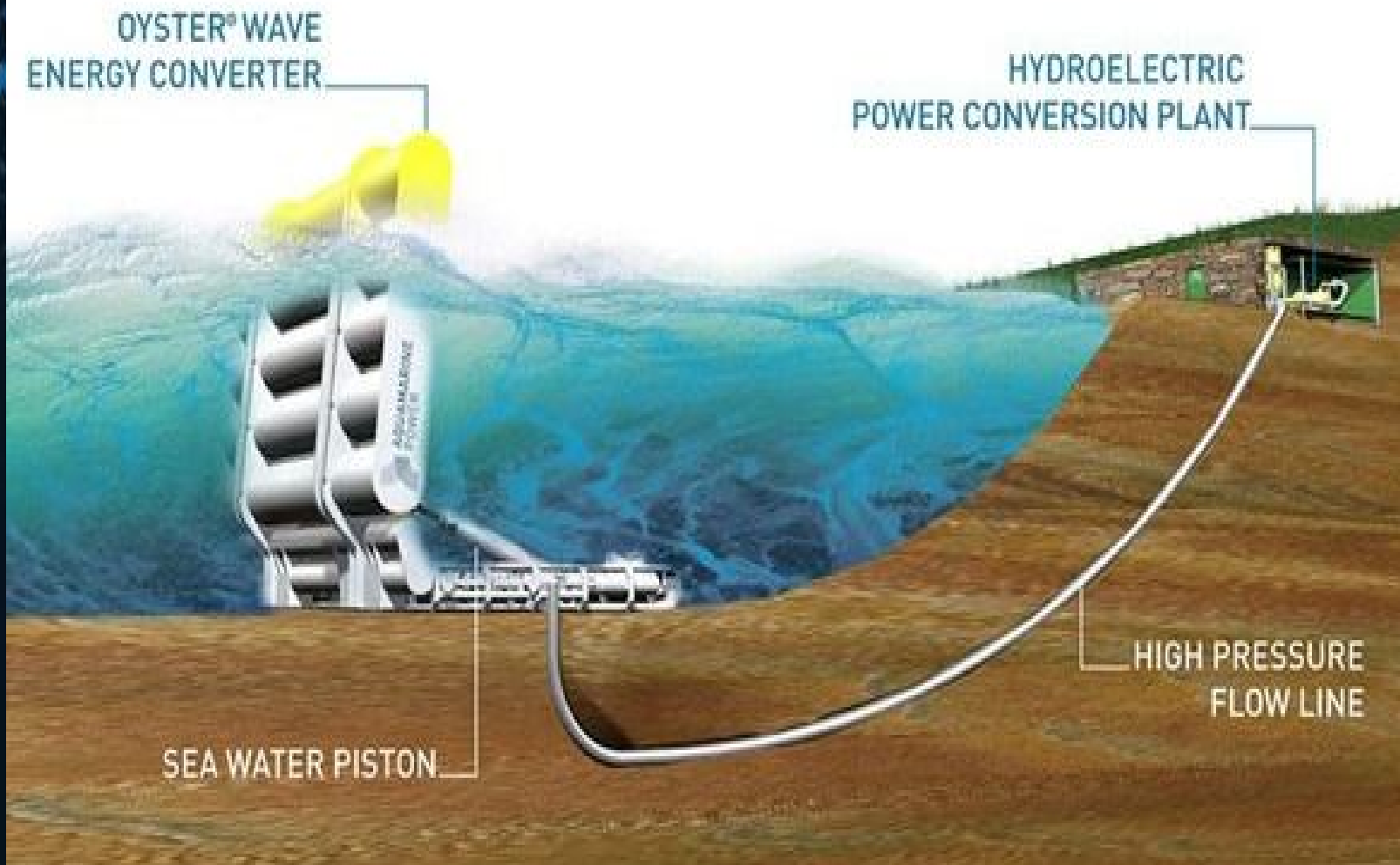
Specifications:
Rated Capacity 250 kW - 1 MW
Deployment Depth >50 m

Development Milestones:
2007: Ocean deployment of heave only prototype
2009: Wave tank tests
2009: Preliminary full scale testing

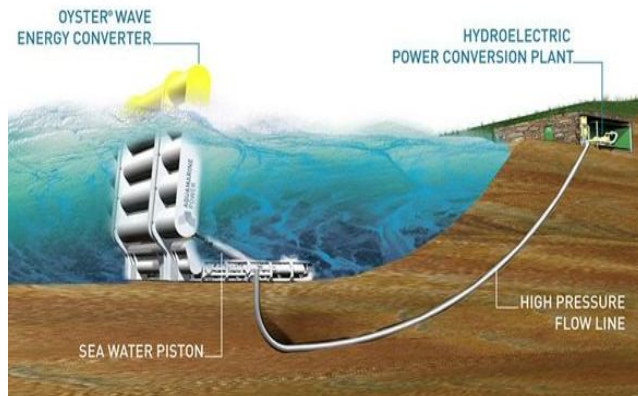
Company Profile:
Founded in 2005
> \$3 million invested to date
7 employees



Aquamarine Power



Aquamarine Power



Principle of Operation:

Pressurized Hydro

Specifications:

Rated Capacity 300-600 kW

Minimum Deployment Depth: 10 m

Development Milestones:

2003: Subscale testing

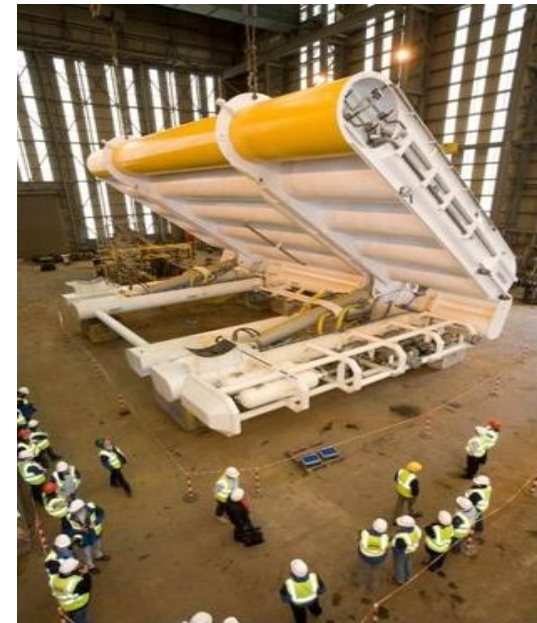
2009: Announces 1000 MW of site development w/ Airtricity

2009: Plans for full scale deployment

Company Profile:

Founded in 2005

> 10 employees



BioPower Systems (bioWAVE)

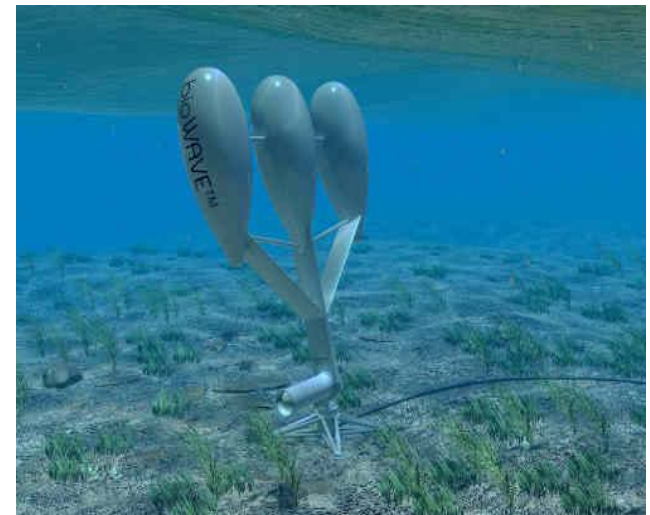


Principle of Operation:
Oscillating Flow Field

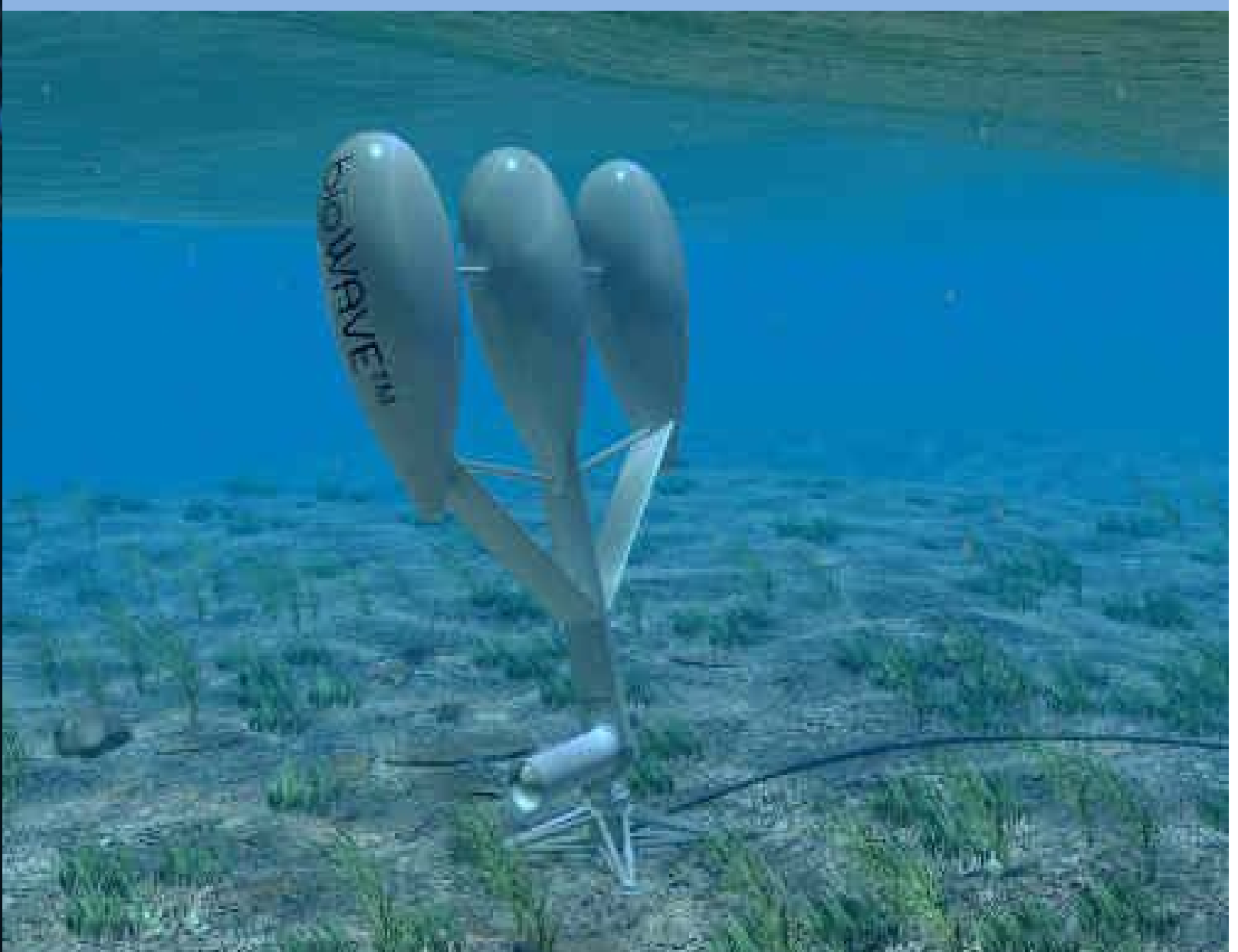
Specifications:
Rated Capacity 250 kW
Deployment Depth: 25-30 m

Development Milestones:
2008: Signed MOU to test and demonstrated in Tasmania
2008: Raised \$6 million

Company Profile:
Founded in 2006
\$7.2 million invested to date
11 employees



BioPower Systems (bioWAVE)



Oceanlinx



20 employees

Oceanlinx



Principle of Operation:
Oscillating Water Column

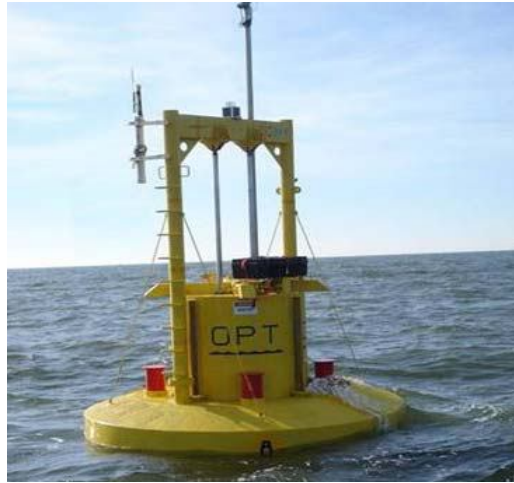
Specifications:
Rated Capacity 500 kW
Deployment Depth: 10 m

Development Milestones:
2005: Installation of 500 kW
prototype
2009: New prototype in
development

Company Profile:
Founded in 1997
\$50 million invested to date
25 employees



Ocean Power Technologies



Principle of Operation:

Point Absorber

Specifications:

Rated Capacity 150 - 500 kW

Deployment Depth: 50 m

Development Milestones:

2007: 1st PPA issued by FERC in Oregon

2007: \$100 M IPO (Nasdaq)

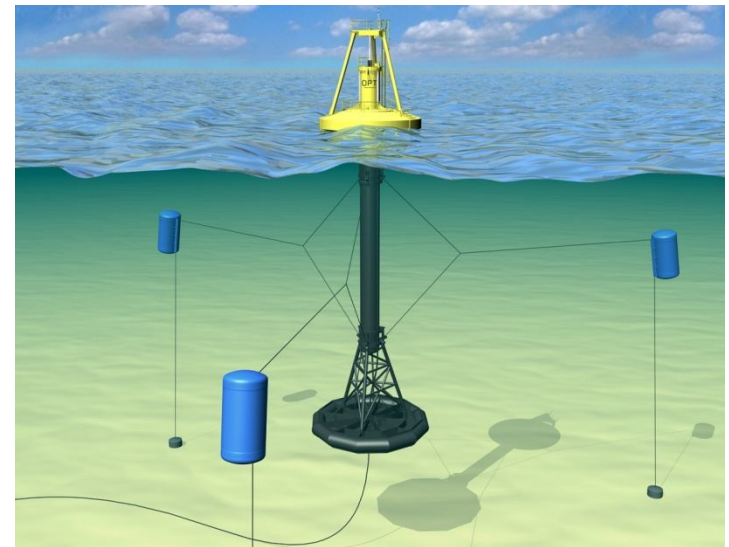
2009: FERC license application

Company Profile:

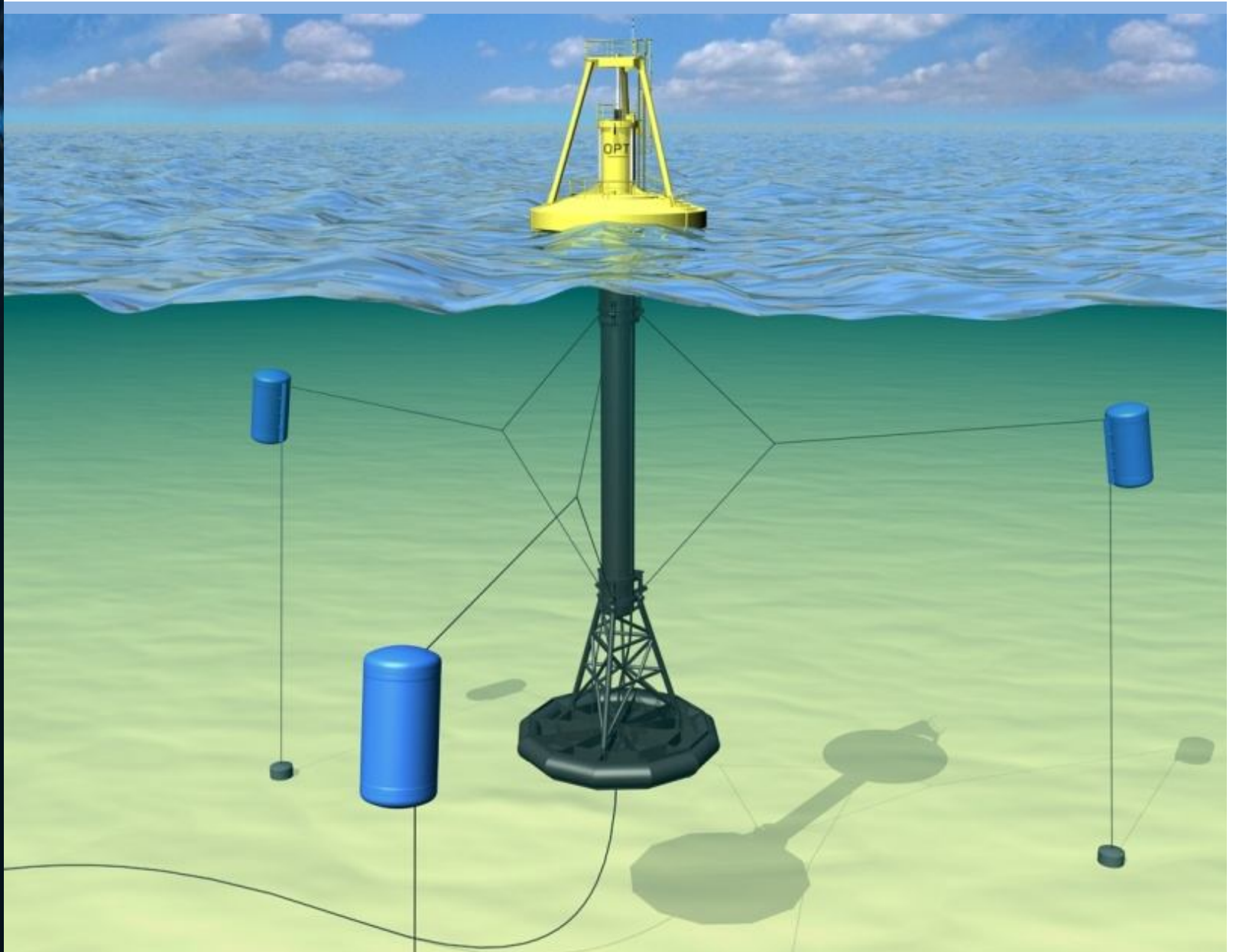
Founded in 1994

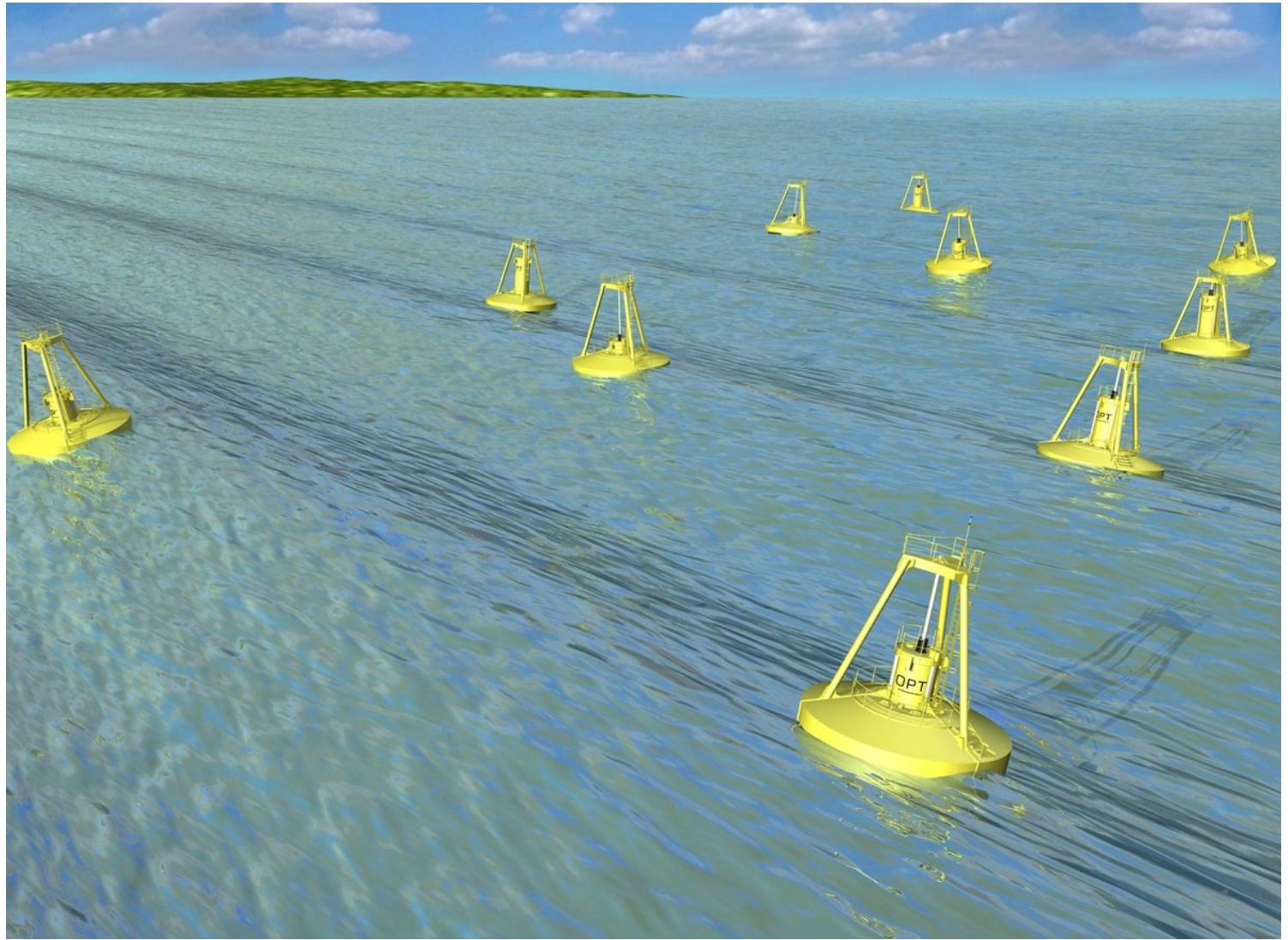
World's 1st publically traded Co

50 employees



Ocean Power Technologies





Wavebob Ltd



Wavebob Ltd



Principle of Operation:
Point Absorber

Specifications:
Rated Capacity > 1 MW
Deployment Depth: N/A

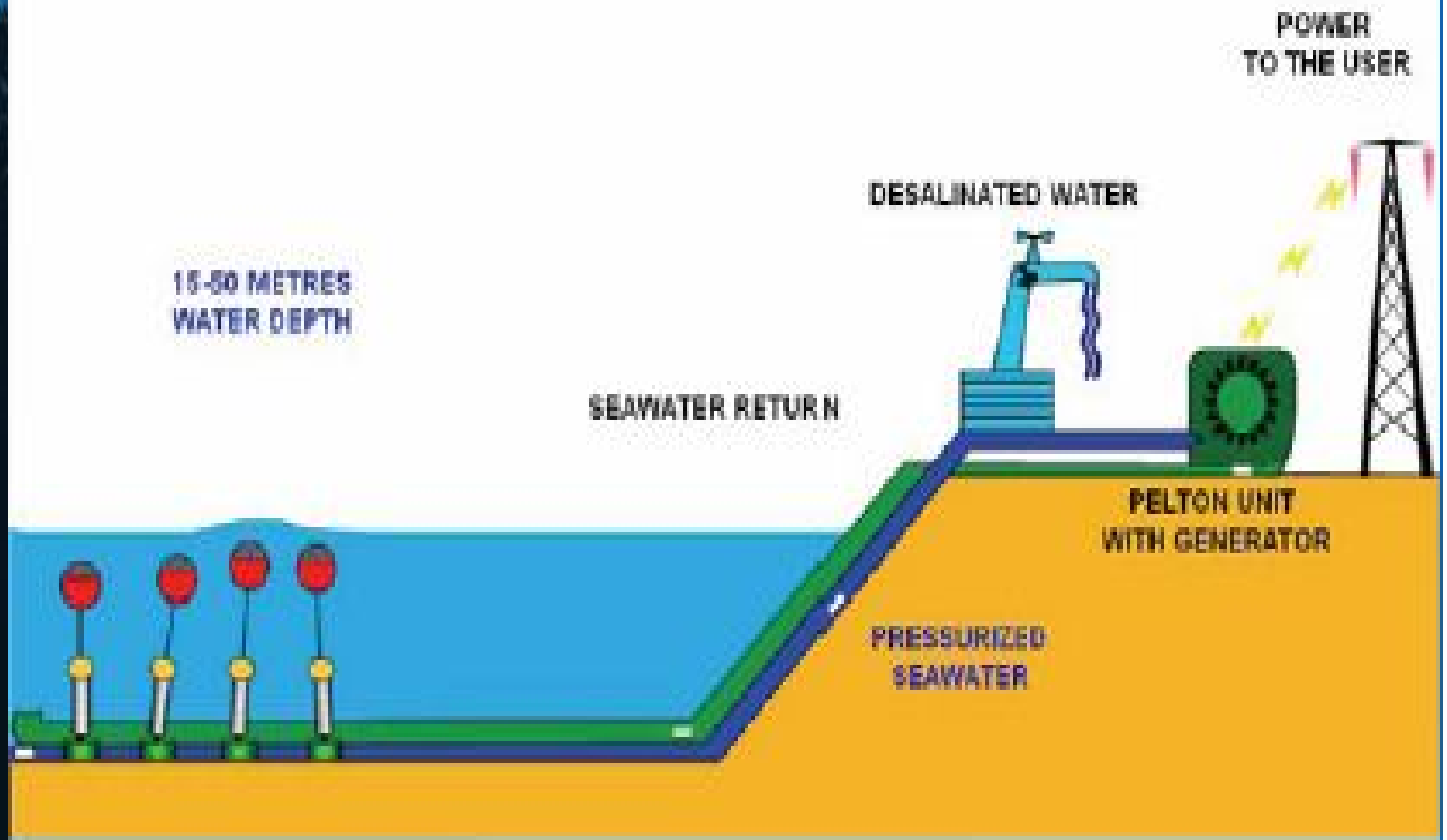
Development Milestones:
2006: Prototype sea trials
2009: Commercial testing
planned

Company Profile:
Founded in 1997

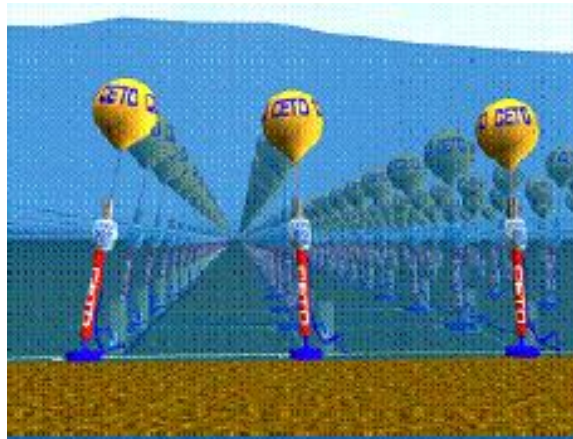


CETO (Renewable Energy Holdings)

OVERALL POWER AND WATER SCHEMATIC



CETO (Renewable Energy Holdings)



Principle of Operation:
Pressurized Seawater

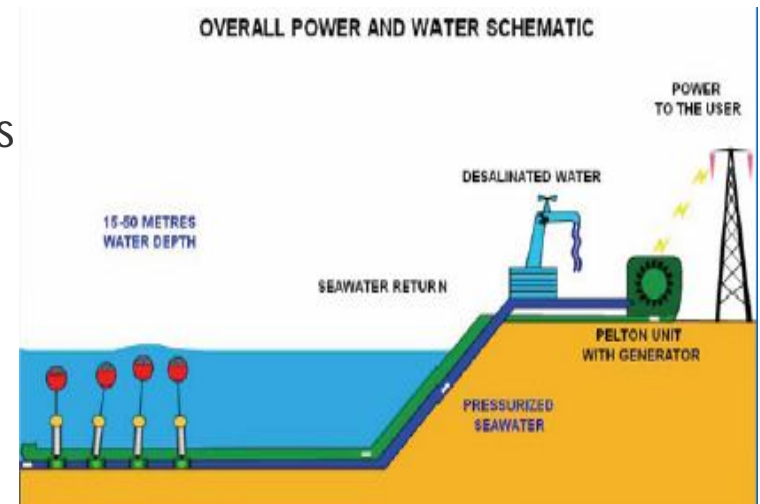
Specifications:
Rated Capacity 180 kW
Deployment Depth: 15 -100 m

Development Milestones:

2006: 1 year of testing
2008: Pre commercial sea trials
2009: Commercial launch of CETO

Company Profile:

Founded in 2004
\$5 million invested to date
9 employees



Wave Star Energy



Wave Star Energy

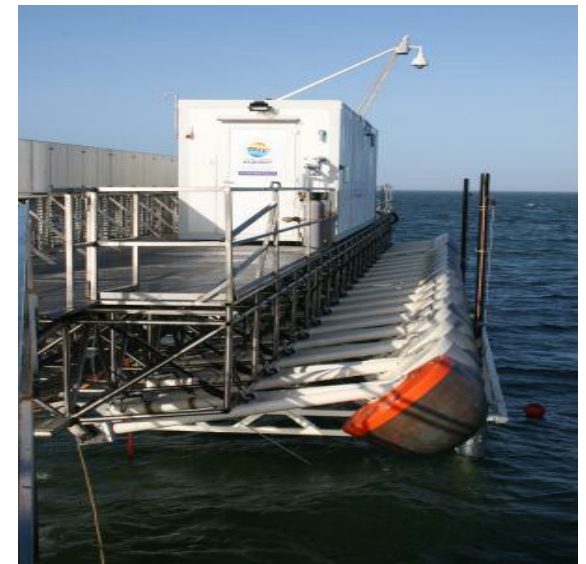


Principle of Operation:
Point Absorber

Specifications:
Rated Capacity 6 MW
Deployment Depth: 15 m

Development Milestones:
2008/9: Section of 500kW to be deployed in North Sea
2009: Half scale model planned for deployment

Company Profile:
Founded in 2003
\$15 million invested to date
14 employees



Hidroflot



Principle of Operation:

Point Absorber

Specifications:

Rated Capacity 6 MW

Deployment Depth: 60 – 100 m

Development Milestones:

2007: Design, construction and testing

2009: Begin building of full scale prototype

Company Profile:

Founded in 2005

\$2 million invested to date

14 companies involved



WaveGen



WaveGen



Principle of Operation:
Oscillating Water Column

Specifications:
Rated Capacity 300 kW
Deployment Depth: Shore based

Development Milestones:
2000: Grid connected test facility
2009: Begin building of full scale prototype

Company Profile:
Founded in 1990
Voith Hydro Company
14 companies involved



Pelamis Wave Power



Principle of Operation:
Attenuator

Specifications:
Rated Capacity 750 kW
Length: 150 m Diameter: 3.5 m
Nominally 50 m Depth

Development Milestones:

2004: Full scale deployment (EMEC)
2005: Received order for devices
2009: 3 units installed producing
power to Portuguese power grid

Company Profile:

Founded in 1998
\$70 million invested to date
75 employees



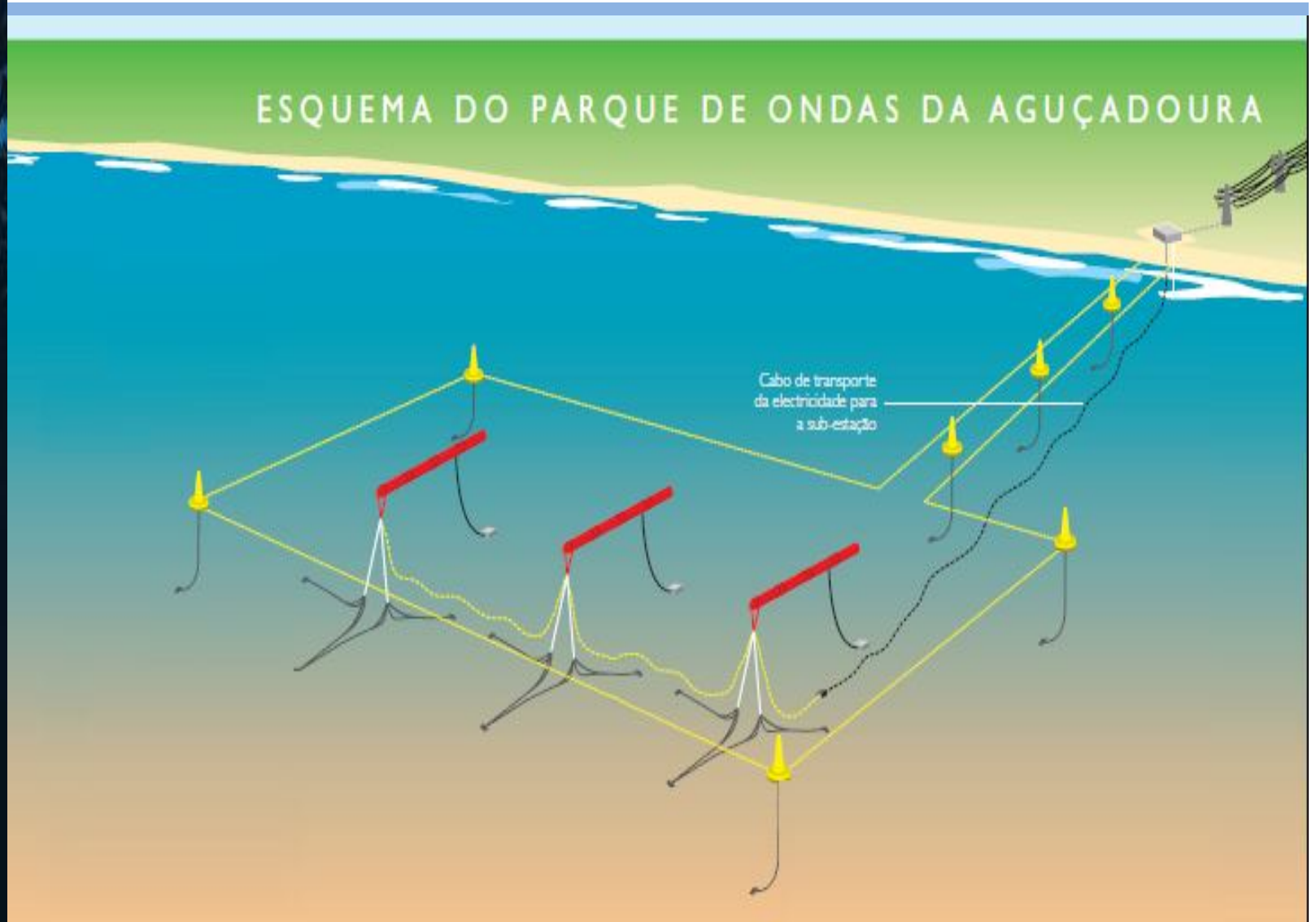
World's First Wave Farm



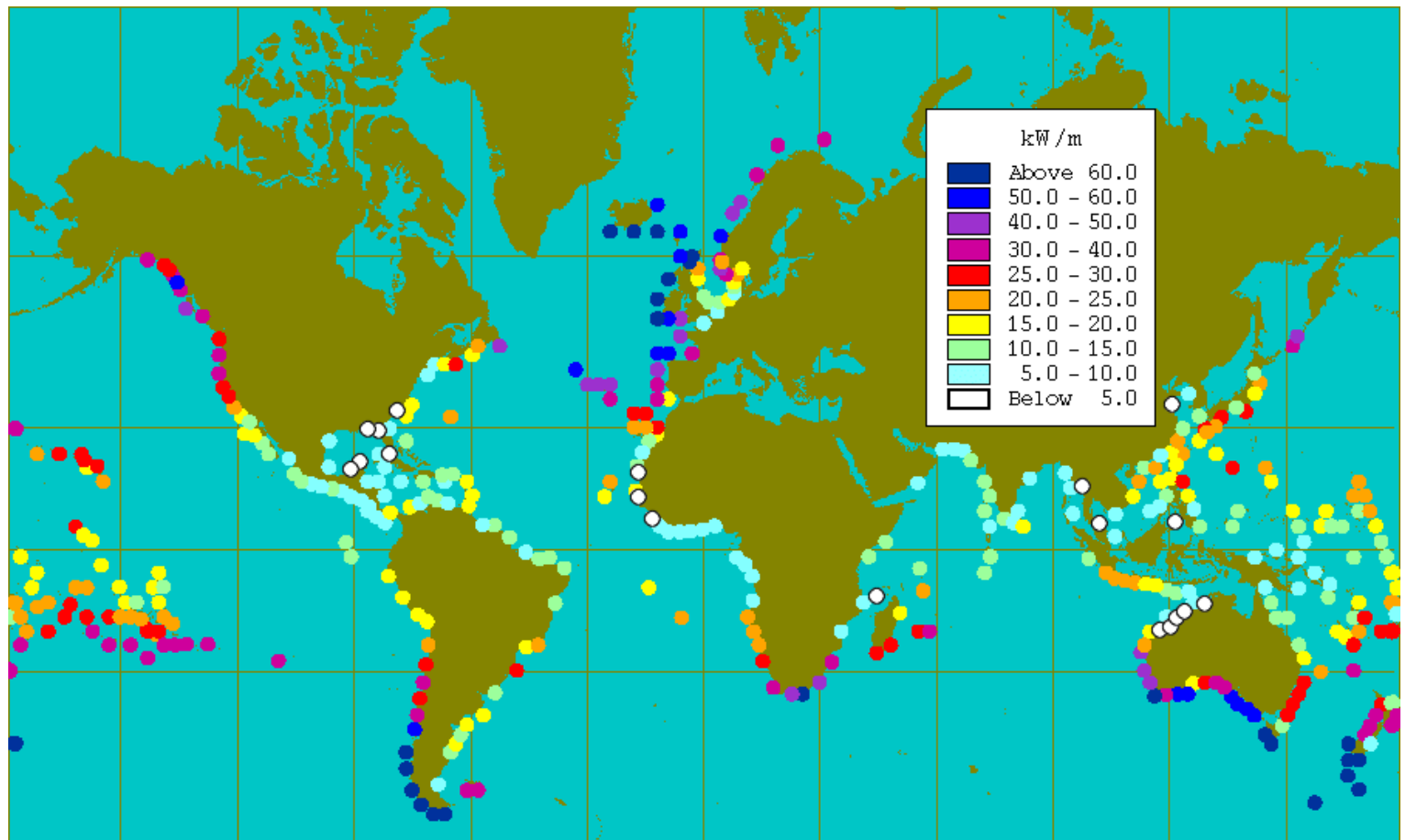
World's First Wave Farm



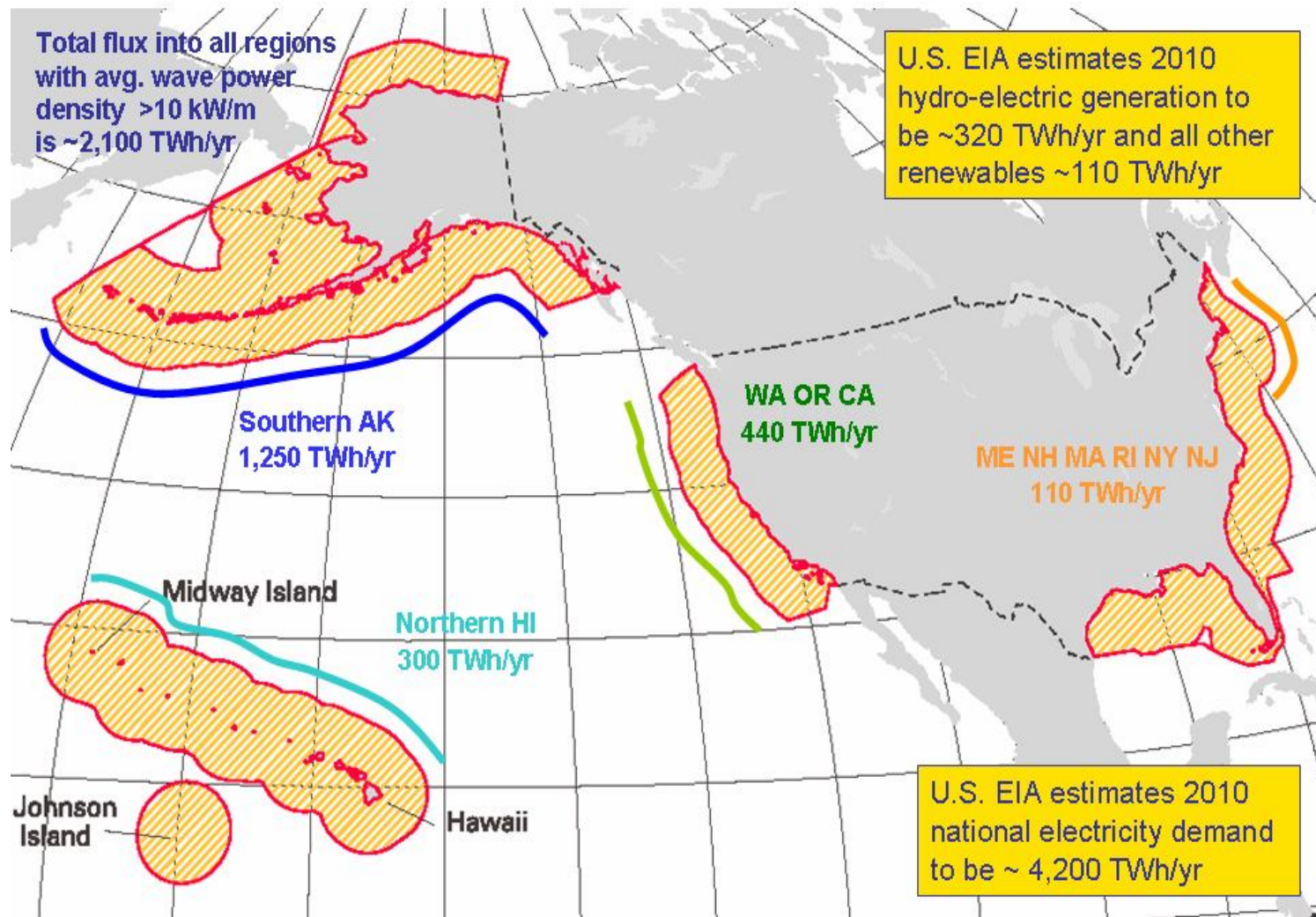
World's First Wave Farm



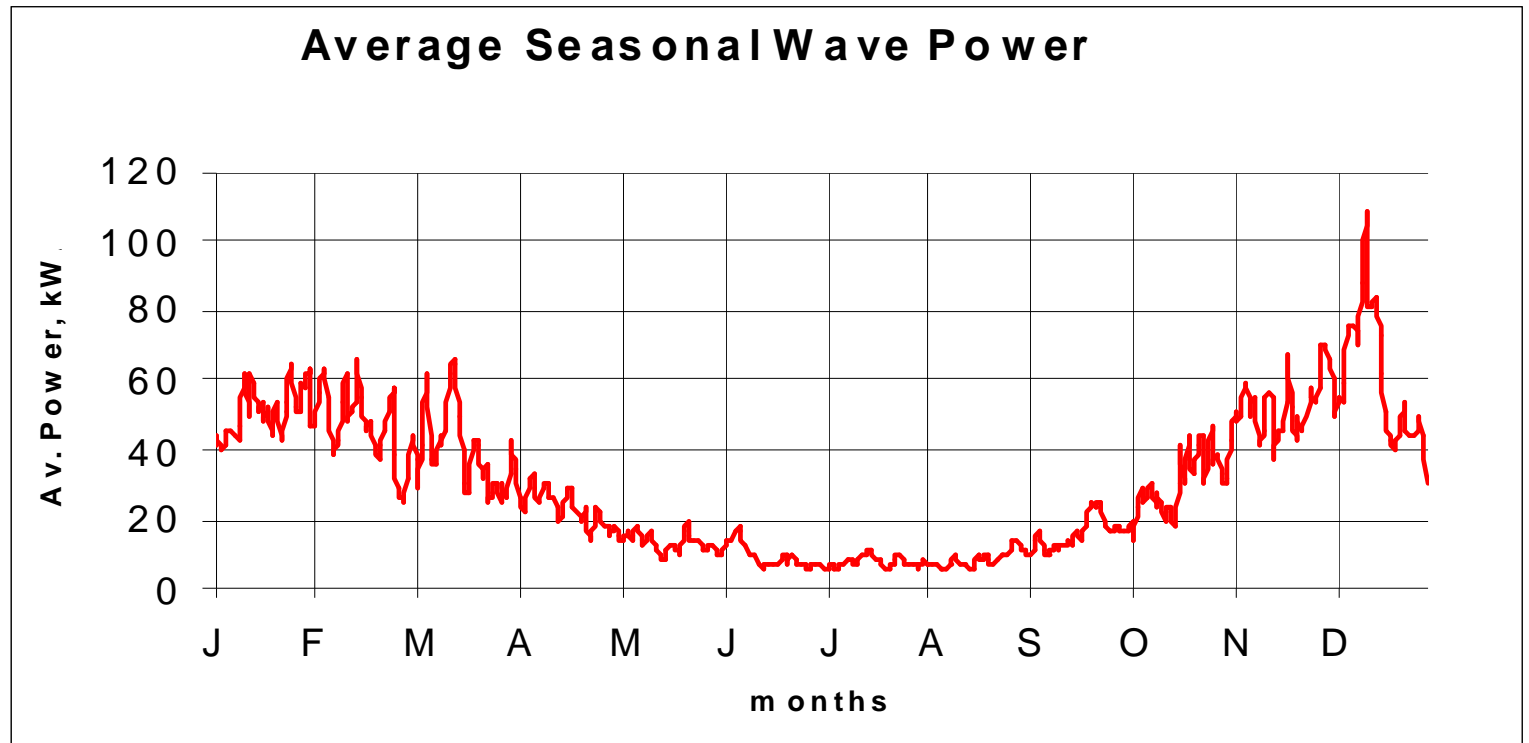
Resource Potential



Resource Potential



Northwest Profile



Annual average wave energy flux per unit width of wave crest (kilowatts per meter crest length)